

**Results of the 1991 Survey for  
Harlequin Duck (Histrionicus histrionicus)  
Distribution in the Non-wilderness Portion  
of the Flathead National Forest, Montana**

submitted by:

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## Summary

This survey of harlequin ducks was conducted in the non-wilderness portion of the Flathead Basin on Flathead National Forest Lands and Stillwater State Forest Lands. Stream surveys began on 15 July 1991 and ended on the 31 August 1991. Physical characteristics of each stream were evaluated qualitatively. Discharge measurements were provided by Wally Page, hydrologist for the Flathead National Forest. One breeding pair of harlequin ducks was observed during this survey. Unusually late spring run-off causing inundation of nest sites and drowning chicks may be the reason for the lack of breeding success.

One harlequin hen was found on the Stillwater State Forest. Five single female harlequins and 1 female with a brood of four young were found in the Glacier View Ranger District. Two Harlequin hens were observed in the non-wilderness portion of the Spotted Bear Ranger District. No harlequins were observed in the Hungry Horse Ranger District. I received reports of pairs along the North Fork of the Flathead River in the Glacier View Ranger District in April and May by several individuals. One hen with a brood of three young was reported on the North Fork of the Flathead River in the Glacier View Ranger District. One individual reported two separate sightings at different locations on the Middle Fork of the Flathead River. One of these sightings was a hen with a brood of three young between Moccassin Creek and West Glacier and the other was a hen with a brood of five young in the wilderness portion of the Middle Fork. A table of stream characteristics is included in the appendix. Those streams meeting harlequin habitat criteria worthy of future surveys are highlighted.

## **Objectives**

The objectives of this study were to assess the distribution of harlequin ducks in the non-wilderness portion of the Flathead National Forest and evaluate the habitat suitability for harlequins of each stream in the survey.

## **Introduction**

Harlequin ducks (*Histrionicus histrionicus*) are unique sea ducks that winter in coastal areas and migrate inland to nest along swiftly flowing mountain streams. Two distinct populations exist: one in the Atlantic and one in the Pacific. Little information is available concerning harlequin duck migration patterns, breeding biology or habitat requirements (Carlson 1990). Due to the lack of understanding concerning harlequin habitat requirements and increasing encroachment into pristine areas by recreational enthusiasts, the United States Forest Service has listed the harlequin duck as a Sensitive Species (Reel, Schassberger, and Ruediger 1988).

The Flathead National Forest contracted with the Montana Natural Heritage Program through the Challenge Cost-Share Program to conduct harlequin surveys in 1991. This cooperative agreement has been conducted each summer season since 1988. The objectives of the ongoing harlequin duck project are to collect information on the distribution and population numbers of harlequin ducks in Montana; to identify and describe occupied nesting, brood rearing, and migratory habitats, and to eventually develop a habitat suitability model (Fairman 1990). I began this study on July 15, 1991. My primary goal was to record the distribution and population numbers of harlequin ducks in the non-wilderness portion of the Flathead National Forest. In addition, I identified and described brood rearing sites and collected stream habitat data. This report includes the findings of the 1991 field season.

## **Overview**

The pacific population of harlequin ducks extends from central California to northern Alaska and inland to the east front of the Rocky Mountains and south into northwest Wyoming (Bellrose 1976). Northwest Montana is on the eastern fringe of the migration route for the Pacific Coast population of harlequins. Breeding harlequins have been found on the Kootenai, lower Clark Fork, and Flathead River drainages; streams in Glacier and Yellowstone National Parks; and streams on the east front of the Rocky Mountains (Kuchel 1977; Fairman, personal communication). Breeding populations are uncommon and localized in western Montana despite numerous streams which superficially appear to provide suitable habitat (Kuchel 1977).

Harlequin ducks congregate in secluded coastal waters between July and April. Males tend to spend more time in coastal waters than do females. Pair bonding most likely occurs at this time (Wallen 1987). Harlequin ducks spend approximately 2 to 5 months in Montana with pairs arriving in late April or early May. Nonbreeding and unmated ducks also migrate inland. Males return to the coast by mid to late June generally leaving just prior to initiation of incubation (Kuchel 1977; Wallen 1987). Unpaired females remain at the nesting grounds for for 3-5 weeks before returning to the coastal waters. Hens with broods depart in late August.

Harlequins exhibit a strong nest site tenacity, often returning to the same site yearly (Kuchel 1977; Wallen 1987; Wallen and Groves 1989). Nesting, incubation, and hatching dates vary with local populations. This may be attributed to differences in spring run-off



from one locale to another, differences in elevation, or for other reasons unknown at this time (Kuchel 1977; Wallen 1987). Egg incubation in Idaho begins in mid-May with hatching occurring 30 days after (Wallen and Groves 1989).

Wallen and Groves (1989) found harlequins in Idaho to occupy fast running mountain streams with a dense canopy of shrubs. Aquatic insects are the primary diet of harlequins in the Rocky Mountains (Kuchel 1977; Wallen 1987). A number of studies documenting harlequin habitat in the Rocky Mountains have taken place over the past 15 years (Kuchel 1977; Wallen 1987; Wallen and Groves 1989; and Fairman and Miller 1990). Based on these studies it is possible to develop a list of summer habitat requirements for harlequins:

1. a stream with good water quality and a high density of aquatic insects.
2. a low gradient perennial stream with areas of swift water.
3. stream side cover, usually comprised of moderate to dense shrubs.
4. presence of cover and loafing areas such as logjams, debris piles, mid-stream rocks, and gravel bars.
5. presence of brood rearing areas such as beaver ponds, stream braids, meanders, side channels.

These habitat requirements may assist public land managers with policies accommodating the needs of harlequin ducks.

## **Survey Area**

This study took place in the non-wilderness portion of the Flathead National Forest and Stillwater State Forest. The streams surveyed in this study were located in the Tally Lake Ranger District, Glacier View Ranger District, Hungry Horse Ranger District, and Spotted Bear Ranger District (figure 1). All of these streams are tributaries of the three main stems of the Flathead River and the Stillwater River.

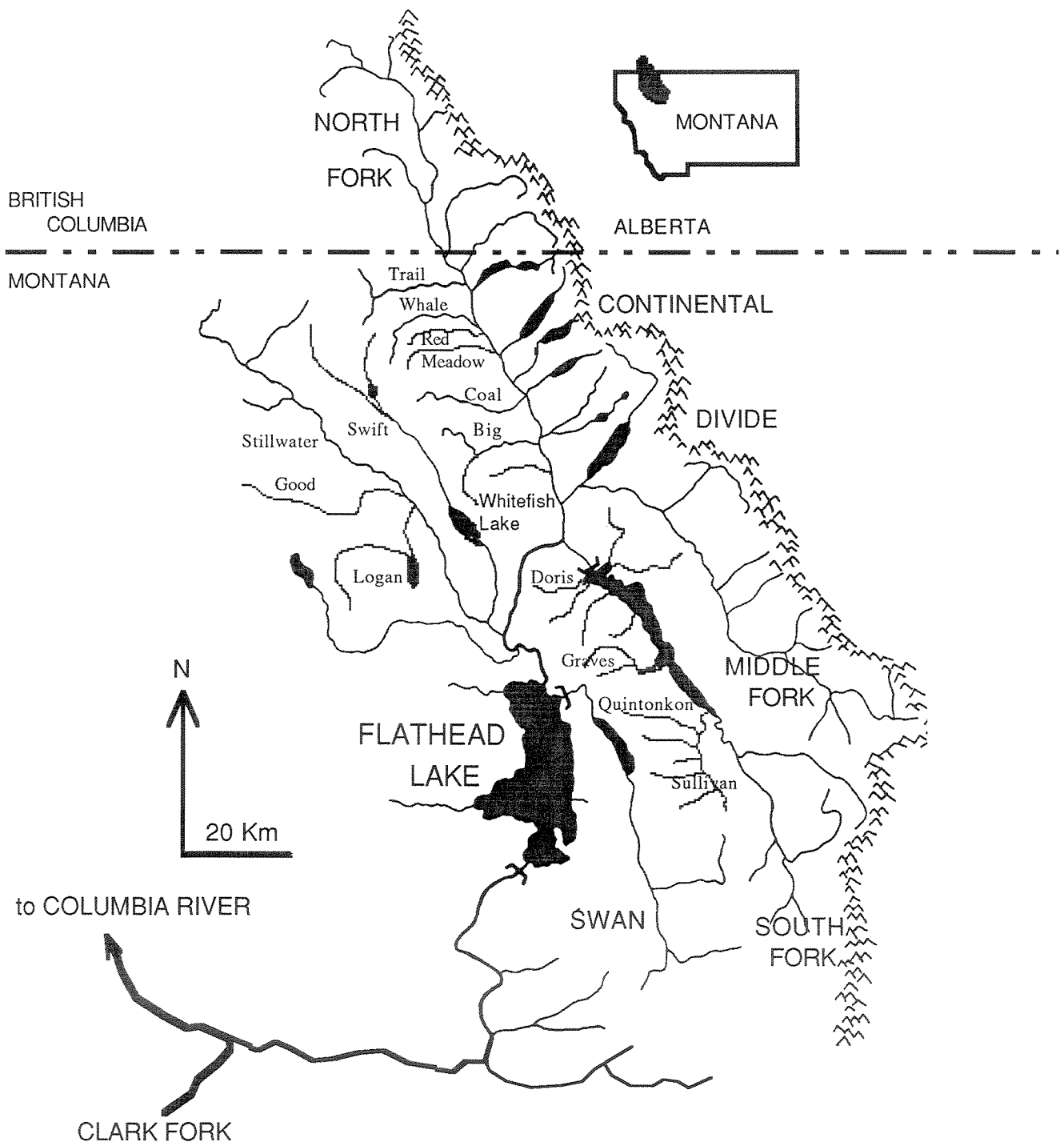


Figure 1: Major streams in the study area

## **Methods**

Streams surveyed in this study were pre-selected by David Genter of the Montana Natural Heritage Program. Surveys were conducted by hiking up the stream bed and frequently glassing ahead with binoculars. Four streams were surveyed by floating in a kayak. Analysis of the physical characters of each stream were done qualitatively using scaling methods described by Carlson (1990). Stream flow data was obtained from the Forest Hydrologist for the Flathead National Forest. Benthic macroinvertebrate densities were estimated qualitatively based on the authors past experience working with benthos. All the streams surveyed were rated as having normal densities of aquatic insects with some registering higher than others. Streams in Northwest Montana typically have low densities of aquatic insects due to the low nutrient concentrations in the soils. The following measurement scales are taken in part from Carlson (1990). Stream characteristics based on the criteria below are evaluated in the table included in the appendix.

1. Ground cover measurements were based on the following scale.

low = 0% - 30% ground cover

medium = 31% - 70% ground cover

high = 71% -100% ground cover

2. Stream bank vegetation was divided into three groups; herbaceous, shrub, tree. Dominant vegetation was determined by that shading the highest percentage of area for a distance of 15 feet from the stream bank.

3. Channel type.

braided                      Stream channel is located in a flat bottomed valley with shallow channels and islands. The channel may shift slightly during each peak flow period.

canyon                      Stream channel is structurally controlled by a "v" shaped valley. Rapids and runs characterize the stream flow. Virtually no movement of the channel occurs during peak flow periods.

4. Channel width was measured in feet.

5. Availability of mid-channel loafing sites.

low - 0 sites / 10 meters of stream

medium - 1-3 sites / 10 meters of stream

high - > 3 sites / 10 meters of stream

6. Frequency of debris jams.

low - < 5 / stream mile

high - > 5 / stream mile

7. Dominant substrate composition. Abbreviations are used in the table.

sand - < 1/4 "

pebbles (peb) - 1/4" - 1"

gravel (grav) - 1" - 2.5"

cobble (cob) - 2.5" - 10"

boulder (boul) - >10"

bedrock (bed)

8. Zoobenthos density.

normal- determined as normal for Flathead Basin streams

high- above normal for Flathead Basin streams

9. Does logging occur adjacent to the stream bank with little or no stream management zone? The approximate age of the cutting unit is included.

10. Harlequins present?

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## Results and Discussion

I surveyed 38 pre-selected streams in the non-wilderness portion of the Flathead National Forest and Stillwater State Forest from 15 July 1991 to 31 August 1991. Thirteen harlequin ducks were observed by myself (table 1). I found only one brood during the survey suggesting that the remainder of the sightings were either unsuccessful breeders or non-breeding females. The brood was located on Trail Creek near Carlson's (1990) observation of a brood. Trail Creek also contained the highest concentration of harlequins; nine on Trail Creek (including the brood) and one at the confluence with the North Fork of the Flathead River. Three harlequin hens on Trail Creek were found together sharing a loafing site with a common merganser. One harlequin hen was observed on Swift Creek. Two harlequin hens were found together on Sullivan Creek.

#	Date	Creek	Observation
1	7/23/91	Swift	1 female observed feeding in stream TN <sup>33?</sup> 32, R23W, Sect 24, NW 1/4
2	8/5/91	Trail	Observed 1 female with brood, 3 females together, 1 solitary female, T <sup>37</sup> 36N, R22W, Se 28, SW 1/4 and Sect 33, NE 1/4
3	8/6/91	North Fork	1 female moving upstream then loafing T <sup>37</sup> 36N R21W, Sect 36, SE 1/4
4	8/19/91	Sullivan	2 females feeding below riffle then loafing cliff T <sup>17</sup> 26N, R16W, Sect 1, SW 1/4

Table 1: Harlequin duck observations in the non-wilderness portion of the Flathead National Forest and Stillwater State Forest.

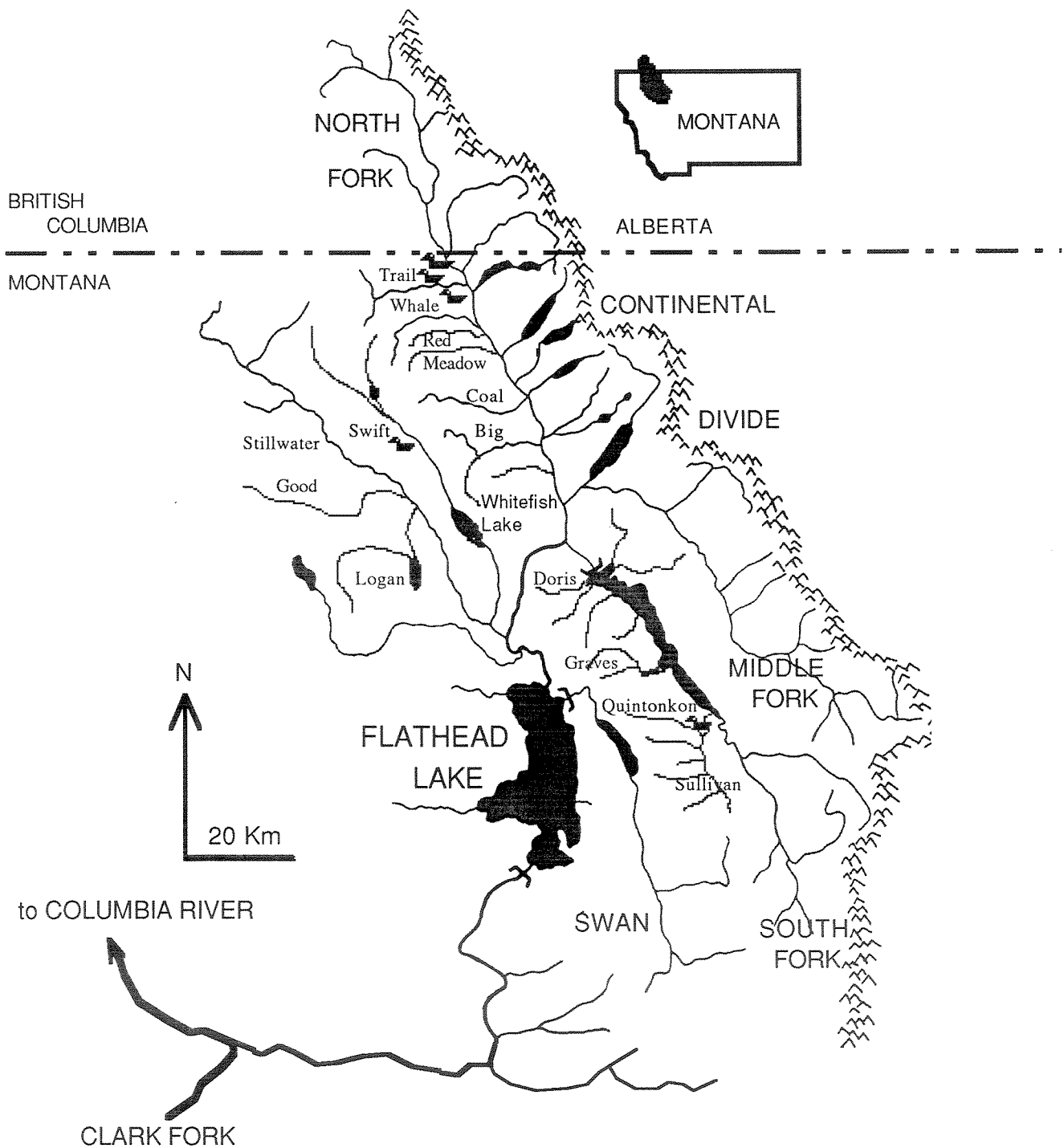


Figure 2: Harlequin duck sightings in the non-wilderness portion of the Flathead National Forest. Locations are marked with the silhouette of a duck. Harlequins were observed on four streams between July and August, 1991.



I surveyed Logan Creek, Swift Creek, Trail Creek, Whale Creek and portions of the North Fork and Middle Fork of the Flathead River by kayak. This method appears to be a promising technique for future surveys. I observed 5 adults and 1 brood on Trail Creek using this method and 1 adult on Swift Creek. Comparisons of harlequin observations while kayaking streams verses hiking are not appropriate due to the low number of observations. However, while kayaking I was able to approach birds closely before being detected compared to being spotted from a distance of 200 yards by harlequins while hiking upstream. In addition, this method makes otherwise remote stretches of the stream more accessible and insures a complete survey of the reach. However, not all reaches are safe to boat due to steep gradients and excessive debris jams.

Stream characteristics were assessed qualitatively. A list of these characters are included in the appendix of this report. It is not understood why harlequins choose one stream over another, however, Carlson (1990) suggests there is strong site tenacity based on the fact that harlequins can generally be found occupying the same site from one year to the next. A number of streams in the Flathead Basin appear to have suitable harlequin habitat. However, specific criteria for harlequin habitat remains undefined in the literature other than generalities on stream gradient and volume. Of the 38 streams surveyed, a number appeared to match habitat criteria described in the literature or resembled characters of streams containing harlequins. These streams are mentioned in the summary of harlequin habitat for each ranger district. Also, an asterisk appears for streams that contain promising harlequin habitat.

## **Summary of Harlequin Duck Habitat by Ranger District**

### Glacier View Ranger District

Trail Creek contained the most ducks of any stream in the Glacier View Ranger District. Five adult birds were observed in the vicinity ✓ of the confluence with Cleft Creek. One hen had a brood of four young. I was unable to calculate the age of this brood. Three of the birds were found together loafing on a rock shared with a common merganser. Another single hen was found further downstream while still in sight of the other three. No other harlequins were found on Trail Creek proper. Another common merganser with a brood of 10 was found downstream of the harlequin sightings. Carlson (1990) found a dry channel on Trail Creek above Thoma Creek. The channel contained approximately 80 cfs during this study season. This section of Trail Creek above Thoma Creek contains good harlequin habitat worthy of further investigation. A single harlequin hen was observed at the confluence of Trail Creek with the North Fork of the Flathead ✕ River.

No other harlequins were observed by the author in the Glacier View Ranger District. However, several observations were reported by other parties in the Glacier View Ranger District. Lee Christianson, director of the Glacier Institute, reported seeing two pair of harlequins throughout April and early May. One pair was located on Big Creek near the Glacier Institute and the other pair was located at the confluence of Big Creek with the North Fork of the 56-090 Flathead River. Mike and Barbara Bureau, North Fork residents, observed a pair April 23-30, 1991 on the North Fork of the Flathead

River near mile marker 45 on the North Fork road. George Widenor, owner of Lake/Stream Fly Shop in Whitefish, observed a harlequin with a brood of three on 15 July 1991 in the pool just above the confluence with Trail Creek on the North Fork of the Flathead River. ✓

Several streams in the Glacier View Ranger District warrant further investigation. Lower Whale Creek from the bridge on forest service road 1671 to the confluence with the North Fork of the Flathead River. Hay Creek from the bridge on forest service road 376 to the bridge on forest service road 210 (North Fork Road). Coal Creek from the bridge on forest service road 317 to the confluence with the North Fork of the Flathead River. Big Creek from Langford Creek to the confluence with the North Fork of the Flathead River. These reaches appear to have habitat suitable for harlequins despite their absence during this sampling season.

#### Tally Lake Ranger District

One harlequin hen was found on Swift Creek in the Stillwater State Forest on the 23 July 1991 approximately 1 mile downstream of the Stryker Ridge road. Carlson (1990) suggested that Swift Creek might contain more harlequins than he had observed in 1989 and 1990 due to the inaccessibility over much of its length. I was able to float Swift Creek from the confluence with Swede Creek to Whitefish Lake.

No other harlequins were found on streams in the Tally Lake Ranger District. Habitat criteria appeared suitable for harlequins along portions of the streams in the Tally Lake Ranger District, however, streams in this district have a brackish color and are warmer than streams in the Glacier View and Hungry Horse Ranger Districts with

the exception of Swift Creek. Logan Creek, Good Creek, and the Stillwater River contain swampy sections which could be causing the color change due to increased organics and elevated water temperatures. There is one questionable spring sighting on Logan Creek below Tally Lake by a couple that lives along the stream. I was unable to confirm the sighting with the husband who seemed to be confused whether it was a wood duck or harlequin.

#### Hungry Horse Ranger District

No harlequin ducks were observed on streams in the Hungry Horse Ranger District. Several streams appear to meet the habitat criteria for harlequins and warrant further investigation in future years: approximately the first 2 miles of Doris Creek above Hungry Horse Reservoir, approximately the first 2 miles of Lost Johnny Creek above Hungry Horse Reservoir, Wounded Buck Creek to approximately 1 mile above the confluence with Wildcat Creek, lower portions of Wildcat Creek, Aeneas Creek from the spur road (no number) to the mouth in Hungry Horse Reservoir, Graves Creek from approximately 1 mile inside the wilderness boundary to the confluence with Aeneas Creek, Wheeler Creek from forest service road 1610 to the mouth in Hungry Horse Reservoir, and Hungry Horse Creek from the confluence with Tiger Creek to the mouth in Hungry Horse Reservoir.

### Spotted Bear Ranger District

Two harlequin hens were observed on Sullivan Creek approximately 1 mile upstream of the bridge crossing Hungry Horse Reservoir on forest service road 895. No other harlequins were found by this author in the Spotted Bear Ranger District. Quintonkon Creek appears to have suitable habitat warranting further investigation contrary to Carlson's report (1990) which stated that Quintonkon Creek was too small to meet the habitat requirements of harlequins. I found riffles dropping into pools abutted by cliffs on Quintonkon. These cliffs appear to offer excellent loafing sites. Ball, Branch and Connor Creeks all appeared to be too small to offer suitable harlequin habitat. Channel braiding was virtually nonexistent on these creeks. There was a high number of loafing sites on these streams in August but many of these would be inundated during peak flows in June. Much of Sullivan Creek from Quintonkon to Connor Creek did not meet habitat criteria for harlequins. This reach was a monotonous riffle with large gravel banks upwards of 200 feet wide with very little riparian vegetation offering cover. This is the result of discharge events beyond the channel capacity of Sullivan Creek. The habitat on Sullivan Creek above Connor Creek is much more favorable for harlequins.

### **Conclusions and Recommendations**

This survey found harlequin ducks were unsuccessful breeders on streams in the Flathead National Forest during the summer season of 1991. Of 12 harlequin hens observed by the author, only one had a brood of 4 young. Unusually late spring run-off coupled with a deep

snowpack may have disturbed nesting sites either inundating nest sites and destroying eggs or drowning chicks. Five of the harlequin hens observed were found on the same stream verifying Wallen and Groves (1989) observations that these ducks occur uncommonly and locally in Idaho and Montana.

A number of streams in the Flathead Basin contained habitat components similar to that of Trail Creek which housed the highest concentration of harlequins during this survey. Carlson (1990) also noted an absence of harlequins on streams which otherwise suggested favorable habitat. More emphasis should be placed on quantifying habitat at known breeding sites, documenting breeding biology, nest site location, and requirements for food resources. This data will be beneficial as a reference for field investigators when surveying additional streams and provide valuable information to managers of local forests.

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## Appendix

Appendix A-1: Estimated bankfull, minimum, and August discharge on streams in the Tally Lake Ranger District and Glacier View Ranger District of the Flathead National Forest.

<u>Tally Lake District</u>	Bankfull flow (ft <sup>3</sup> /sec)	Minimum flow (ft <sup>3</sup> /sec)	Est. August flow (ft <sup>3</sup> /sec)
Logan Creek	800	16	45
Good Creek	200	5	20
Stillwater River	800	20	60
Swift Creek	-	-	80
<u>Glacier View District</u>			
Canyon Creek	600	8	15
Big Creek	1500	22	55
Halbwat Creek	600	9	12
Coal Creek	700	10	60
South Fork of Coal Creek	400	7	20
Mathias Creek	200	3	10
Cyclone Creek	200	3	8
Moran Creek	150	2	5
Hay Creek	350	4	12
Red Meadow Creek	500	8	35
Moose Creek	200	3	15
Whale Creek	900	30	70
Shorty Creek	400	8	20
Ninko Creek	80	2	5
Akinikoka Creek	100	3	-
Trail Creek	900	30	70
Tuchuck Creek	200	4	20
Yakinikak Creek	350	5	25

Appendix A-2: Estimated bankfull, minimum, and August discharge on streams in the Hungry Horse Ranger District and Spotted Bear Ranger District of the Flathead National Forest.

	Bankfull flow (ft <sup>3</sup> /sec)	Minimum flow (ft <sup>3</sup> /sec)	Est. August flow (ft <sup>3</sup> /sec)
<u>Hungry Horse District</u>			
Fawn Creek	150	3	8
Doris Creek	450	8	20
Lost Johnny Creek	250	4	15
Wounded Buck Creek	500	10	25
Wildcat Creek	200	4	12
Clayton Creek	150	3	8
Aeneas Creek	200	4	15
Graves Creek	1200	10	18
Wheeler Creek	300	15	10
Riverside Creek	120	2	-
Ryle Creek	100	2	-
Hungry Horse Creek	400	8	15
Emery Creek	400	3	10
<u>Spotted Bear District</u>			
Sullivan Creek	800	10	25
Quintonkon Creek	700	9	18
Ball Creek	100	2	5
Branch Creek	100	2	5
Connor Creek	100	2	5
Slide Creek	100	2	5

Appendix B-1: Characteristics for streams surveyed in the Glacier View Ranger District

Stream	ground cover	Dominant vegetation	Channel type	Channel width	Loafing sites	Debris jams	Dominant substrate	Zoobenthos density	logged no SMZ	Harlequin present
Canyon	med-high	trees	canyon	15-30	med-high	high	cob/bed	good	no	no*
Big	high	tree/shrub	can/braid	20-40	high	low	cob/boul	good	no	no*
Hallowat	high	tree/shrub	canyon	20-30	high	high	cob/boul	good	no	no*
Coal	high	tree/shrub	can/braid	20-40	high	high	cob/boul	good	yes >20	no*
S. FK. Coal	high	tree/shrub	can/braid	15-30	high	high	cob/boul	good	yes >20	no*
Mathias	high	trees	canyon	5-12	high	high	cob/boul	good	no	no
Cyclone	high	shrub/tree	canyon	5-12	high	high	cob/boul	good	no	no
Moran	high	tree	canyon	5-15	high	high	cob/boul	good	no	no
Hay	high	tree	canyon	15-30	high	high	cob/boul	good	no	no*
Red Meadow	med/high	shrub/tree herb	can/braid	20-30	high	high	cob/boul	high	yes/fire	no
Moose	high	tree	canyon	10-20	high	high	cob/boul	good	no	no
Whale	med/high	tree/shrub	canyon	30-50	high	high	cob/boul	good	yes >20	no*
Shorty	high	tree/shrub	braided	15-25	low	high	sand/grav	good	no	no
Ninko	high	trees	canyon	5-12	high	high	cob/boul	good	no	no
Trail	med/high	tree/shrub	can/braid	20-45	high	high	cob/boul	good	no	yes
Tuchuck	high	trees	canyon	10-15	high	high	cob/boul	good	no	no
Yakinikak	high	tree/shrub	canyon	15-20	high	high	cob/boul	good	no	no
North Fork	low/high	tree/shrub	can/braid	100-300	high	low	cob/boul	good	no	yes

- See methods for explanation of abbreviations

Appendix B-2: Characteristics for streams surveyed in the Hungry Horse Ranger District

Stream	ground cover	Dominant vegetation	Channel type	Channel width	Loafing sites	Debris jams	Dominant substrate	Zoobenthos density	logged no SMZ	Harlequin present
Fawn	high	trees	canyon	8-15	high	low	boul/cob	good	no	no
Doris	high	tree/shrub	canyon	15-25	high	high	cob/boul	good	yes >30	no*
Lost Johnny	high	tree/shrub	canyon	15-25	high	high	cob/boul	good	yes >30	no*
Wounded Buck	med/high	tree/shrub	can/braid	15-30	high	high	cob/boul	good	yes >30	no*
Wildcat	high	trees	canyon	5-15	high	high	bed/boul	good	no	no*
Clayton	high	tree/shrub	canyon	5-12	high	high	cob/boul	good	yes >30	no
Aeneas	med/high	tree/shrub	canyon	30-50	high	low	cob/boul/ bedrock	good	no	no*
Graves	high	tree/shrub	canyon	20-30	high	high	cob/boul	good	yes >20	no*
Wheeler	high	tree/shrub	canyon	15-30	high	high	cob/boul/ bedrock	good	yes >20	no*
Emery	high	shrub/tree	canyon	5-20	mod	low	cobble	good	no	no
Hungry Horse	high	tree/shrub	canyon	15-25	high	low	cob/boul	good	no	no*

Appendix B-3: Characteristics for streams surveyed in the Spotted Bear Ranger District

Stream	ground cover	Dominant vegetation	Channel type	Channel width	Loafing sites	Debris jams	Dominant substrate	Zoobenthos density	logged no SMZ	Harlequin present
Sullivan	med/high	tree/shrub	canyon	20-50	high	low	cob/boul/bed	good	no	yes
Quintonkon	high	tree/shrub	canyon	15-30	high	high	cob/boul/bedrock	good	yes >25	no*
Ball	high	trees	canyon	5-12	high	high	cob/boul	good	no	no
Branch	high	trees	canyon	8-15	high	high	cob/boul	good	no	no
Connor	high	tree/shrub	canyon	10-15	high	high	cob/boul	good	no	no
Slide	high	trees	canyon	8-15	high	high	cob/boul	good	no	no

Appendix B-4: Characteristics for streams surveyed in the Tally Lake Ranger District

Stream	ground cover	Dominant vegetation	Channel type	Channel width	Loafing sites	Debris jams	Dominant substrate	Zoobenthos density	logged no SMZ	Harlequin present
Logan	high	tree/shrub	can/braid	20-35	high	low	cob/boul	high	no	no*
Good	high	tree/shrub	can/braid	20-30	high	low	cob/boul	high	no	no*
Stillwater	high	tree/shrub	canyon	25-50	moder	low	bed/boul	high	no	no*
Swift	high	trees	can/braid	20-35	high	high	cob/boul	good	no	yes